

Spring, 2021 (Updated 2 February)

Stat 311: Honors Probability and Mathematical Statistics

Instructor: David W. Scott
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Use CANVAS for HW Submissions and Materials

Tues/Thur: 3:10-4:30 Room DH 1075 (after 2/15)

Office Hours: ZOOM (Friday 5-6) + Online/Email
TA: Kyle Manning (ksm9@rice.edu) We/Th 7-8 ZOOM
Grader also available by appt or email.

Grading:

20% Homework: (20+2)% pledged, but you may discuss problems with others
40% 1st exam: take-home, open book, computer, liberal partial credit (3/18 approx)
40% Final exam: take-home, open book, computer, liberal partial credit

The course divides roughly into thirds:

- i) classical and modern probability (Chapters 2-3)
- ii) probability distributions and random variables (Chapters 4-6)
- iii) statistical methodologies (estimation and testing) (Chapters 7-8)

The class covers material in both Stat 310 and 315 with different emphases. We will cover all sections of our textbook, except portions of Chapter 5. Chapter 9 contains extras that we may or may not touch upon. See TOC and other materials at <http://www.stat.rice.edu/~scottdw> under the STATISTICS boot bullet heading.

Note that MATH 212 (or its equivalent) is a *required prerequisite*.

This course was intended to be in person with zoom. The in-person aspect has been postponed until at least 2/16. Stay tuned.

It is my intention to assign readings before each class. You should read carefully and make a list of questions to bring to class. Lectures will not repeat that material. Instead, we will discuss examples and do R demos and carefully cover potential notational and conceptual issues in the material. Not quite a flipped classroom, but some elements. With the anticipated small class, grades should not be an issue.

Software (all free and/or Rice site licenses):

- R:** Download **R** from <http://www.r-project.org/>. Since our book has no probability tables, you will use **R** to obtain those numbers. While there will not be a computer lab, supplementary material and examples will be posted on my web site. We will use the **R** language for our demos. You will learn enough **R** to do HW/Final exam calculations and simple plots. **R** and **RStudio** tutorials are available on the web.
- M:** Actually **Mathematica**. We will do some symbolic calculus calculations. Rice has a site license that allows you to put this on your personal computer.
- JMP:** **JMP** is a full functioning statistical software package from SAS, Inc. that we will use occasionally for demos. Download from **kb.rice.edu**

Textbook:

D.W. Scott (2020), *STATISTICS: A CONCISE MATHEMATICAL INTRODUCTION FOR STUDENTS, SCIENTISTS, and ENGINEERS*, John Wiley & Sons.

Learning Outcomes

- Understand the role of mathematics in probability and statistics
- Perform exploratory data analysis: summarize and visualize data
- Understand and work with theoretical probability and axioms
- Solve problems of mathematical statistics with random samples
- Perform basic statistical inference for one and two-population problems
- Understand the role of statistics in data science
- Formulate statistical questions and find optimal testing regimes
- Define, perform and interpret appropriate statistical analyses
- Learn to perform simulations and basic analyses with the statistical software, R
- Communicate statistical ideas and test results

Disability Statement

Any student with a disability requiring accommodations in this course should contact me early in the semester. Additionally, students will also need to contact Disability Support Services in the Ley Student Center.

Honor Code

Please follow all instructions on assignments and exams. Any suspected violations of the Honor Code will be reported to the Honor Council.